

CLAIMS

1. An endodontic device for detecting moisture within a root canal, comprising:
an endodontic cone formed of a water absorptive material; and
a moisture sensitive chemical indicator comprising at least one cobalt salt applied to the water absorptive material that changes color when moistened with water.
2. An endodontic device as recited in claim 1, wherein the water absorptive material comprises paper.
3. An endodontic device as recited in claim 1, wherein the cobalt salt comprises at least one of cobalt fluoride, cobalt iodide, and cobalt sulfate.
4. An endodontic device as recited in claim 1, wherein the cobalt salt comprises cobalt chloride.
5. An endodontic device as recited in claim 1, wherein the chemical indicator further changes to a different color to indicate the presence of sodium hypochlorite.
6. An endodontic device as recited in claim 1, wherein the endodontic device is initially blue but changes to pink when moistened with water.
7. An endodontic device as recited in claim 1, wherein the endodontic device is initially blue but changes to black when moistened with aqueous sodium hypochlorite.

8. An endodontic device for detecting moisture and aqueous sodium hypochlorite within a root canal, comprising:

an endodontic cone formed of a water absorptive material; and

a moisture and sodium hypochlorite sensitive chemical indicator comprising at least one cobalt salt applied to the water absorptive material that changes to a first color when moistened with water and a second color when moistened with aqueous sodium hypochlorite.

9. An endodontic device as recited in claim 8, wherein the cobalt salt comprises cobalt chloride.

10. An endodontic device as recited in claim 8, wherein the device is initially blue when dry and changes to pink when moistened with water and to black when moistened with aqueous sodium hypochlorite.

11. An endodontic device for detecting moisture within a root canal, comprising:
- an endodontic cone formed of a water absorptive material;
 - a pH changing material applied to the water absorptive material;
 - a pH sensitive color changing indicator applied to the water absorptive material; and

wherein the endodontic device changes color when moistened with water.

12. An endodontic device as recited in claim 11, wherein the pH changing material comprises an alkali metal oxide, alkali metal hydroxide, alkali metal carbonate, alkaline earth metal oxide, or alkaline earth metal hydroxide.

13. An endodontic device as recited in claim 12, wherein the pH changing material comprises at least one of CaO, KOH, and K₂CO₃.

14. An endodontic device as recited in claim 12, wherein the pH sensitive color changing indicator comprises phenolphthalein.

15. An endodontic device as recited in claim 11, wherein the pH changing material comprises citric acid.

16. A method of manufacturing an endodontic device for detecting moisture within a root canal, comprising the steps of:

providing an endodontic cone comprising a water absorptive material;

applying an aqueous solution that includes a moisture sensitive color-changing chemical indicator comprising at least one cobalt salt to the endodontic cone;

drying the endodontic cone so as to be substantially free of moisture.

17. A method of manufacturing a device as recited in claim 16, wherein the endodontic cone is dried using an oven.

18. A method of manufacturing a device as recited in claim 16, wherein the aqueous solution further comprises at least one of a wetting agent or surfactant.

19. A method of manufacturing a device as recited in claim 18, wherein the wetting agent comprises ethyl alcohol.

20. A method of manufacturing a device as recited in claim 18, wherein the wetting agent is present in the aqueous solution in an amount up to about 10%.

21. A method of manufacturing a device as recited in claim 18, wherein the surfactant is present in the aqueous solution in an amount up to about 1%.

22. A method of manufacturing a device as recited in claim 16, wherein the cobalt salt is present in the aqueous solution in an amount between about 0.5% and about 50% by weight.

23. A method of manufacturing a device as recited in claim 16, wherein the cobalt salt is present in the aqueous solution in an amount between about 5% and about 40% by weight.

24. A method of manufacturing a device as recited in claim 16, wherein the cobalt salt is present in the aqueous solution in an amount between about 10% and about 30% by weight.

25. A method of manufacturing an endodontic device for detecting moisture within a root canal, comprising the steps of:

providing an endodontic cone comprising a water absorptive material;

applying a pH changing solution that includes a pH changing material to the endodontic cone;

drying the endodontic cone so as to be substantially free of moisture;

applying an anhydrous pH sensitive indicator solution that includes a pH sensitive color changing indicator and an anhydrous volatile solvent to the endodontic cone;

drying the endodontic cone so as to be substantially dry.

26. A method of manufacturing a device as recited in claim 25, wherein the endodontic cone is dried using an oven.

27. A method of manufacturing a device as recited in claim 25, wherein the pH changing material is present in the pH changing solution in an amount between about 0.01% and about 0.5% by weight.

28. A method of manufacturing a device as recited in claim 25, wherein the pH sensitive color changing indicator is present in the anhydrous pH sensitive indicator solution in an amount between about 0.01% and about 0.5%.

29. A method of manufacturing a device as recited in claim 25, wherein the anhydrous volatile solvent comprises one of isopropanol and ethanol.

30. A method of using a device for detecting moisture within a root canal, comprising the steps of:

inserting an endodontic device as recited in claim 1 within a root canal of a patient's tooth;

withdrawing the device and observing whether the chemical indicator has changed color, indicating the presence of moisture within the root canal.

31. A method of using a device as recited in claim 30, wherein the endodontic device changes to a first color when moistened with water and to a second color when moistened with aqueous sodium hypochlorite.

32. A method of using a device for detecting moisture within a root canal, comprising the steps of:

inserting an endodontic device as recited in claim 11 within a root canal of a patient's tooth;

withdrawing the device and observing whether the chemical indicator has changed color, indicating the presence of moisture within the root canal.